SWI/SNF complexes, chromatin remodeling and skeletal myogenesis: it's time to exchange!

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Public Summary:
Skeletal muscle differentiation relies on the coordinated activation and repression of specific subsets of genes. This reflects extensive changes in chromatin architecture, composition of chromatin-associated complexes and histone modifications at the promoter/enhancer elements of skeletal muscle genes. An early, key event in the activation of muscle-specific gene transcription is the disruption of the repressive conformation imposed by nucleosomes, which impede the access of pioneer transcription factors, such as the muscle-specific basic helix-loop-helix (bHLH) factors MyoD and Myf5, to their DNA-binding sites. This review focuses on our current understanding of the role of the SWI/SNF ATP-dependent chromatin-remodeling complex in the activation of the myogenic program, by inducing conformational changes permissive for muscle-gene expression. Recent findings suggest that specific combinations of individual SWI/SNF components can generate sub-complexes with specialized functions that are engaged at sequential stages of muscle-gene activation--e.g., initial displacement of the nucleosome followed by the loading of the complete myogenic transcriptosome that promotes gene transcription. SWI/SNF composition and function is regulated by the exchange of specific variants of structural sub-units. In turn, an exchange of histone variants and related epigenetic modifications might reflect the impact of distinct SWI/SNF complexes on the architecture and activity of target promoter/enhancer elements. Thus, the SWI/SNF complexes should be regarded not just as simple executors of the program imposed by transcription factors, but as multifaceted "readers" and "shapers" of the chromatin/DNA landscape within target muscle genes along the transition from myoblasts to myotubes.

Scientific Abstract:
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